PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 17 October 2000 (17.10.00)	
International application No. PCT/SE00/00351	**Applicant's or agent's file reference** Case: 4101 P
International filing date (day/month/year) 23 February 2000 (23.02.00)	**Priority date** (day/month/year) 09 March 1999 (09.03.99)
Applicant BJÖRN, Göran et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

12 September 2000 (12.09.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Nestor Santesso
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

14 -04- 2000

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/SE 00 / 00351
International Application No.

International Filing Date 23 -02- 2000

The Swedish Patent Office
PCT International Application
Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* Case: 4101 PCT

Box No. I TITLE OF INVENTION

Self-tapping implant 09/936169

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

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Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

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☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

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Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

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- [ ] all designated States
- [ ] all designated States except the United States of America
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State *(that is, country)* of nationality: SE

State *(that is, country)* of residence: SE

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [X] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:
- [ ] applicant only
- [ ] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
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Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:
- [ ] applicant only
- [ ] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of:
- [ ] all designated States
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- [ ] Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

- ☒ **AP** **ARIPO Patent:** **GH** Ghana, **GM** Gambia, **KE** Kenya, **LS** Lesotho, **MW** Malawi, **SD** Sudan, **SL** Sierra Leone, **SZ** Swaziland, **TZ** United Republic of Tanzania, **UG** Uganda, **ZW** Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** **Eurasian Patent:** **AM** Armenia, **AZ** Azerbaijan, **BY** Belarus, **KG** Kyrgyzstan, **KZ** Kazakhstan, **MD** Republic of Moldova, **RU** Russian Federation, **TJ** Tajikistan, **TM** Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** **European Patent:** **AT** Austria, **BE** Belgium, **CH and LI** Switzerland and Liechtenstein, **CY** Cyprus, **DE** Germany, **DK** Denmark, **ES** Spain, **FI** Finland, **FR** France, **GB** United Kingdom, **GR** Greece, **IE** Ireland, **IT** Italy, **LU** Luxembourg, **MC** Monaco, **NL** Netherlands, **PT** Portugal, **SE** Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** **OAPI Patent:** **BF** Burkina Faso, **BJ** Benin, **CF** Central African Republic, **CG** Congo, **CI** Côte d'Ivoire, **CM** Cameroon, **GA** Gabon, **GN** Guinea, **GW** Guinea-Bissau, **ML** Mali, **MR** Mauritania, **NE** Niger, **SN** Senegal, **TD** Chad, **TG** Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* .....

National Patent *(if other kind of protection or treatment desired, specify on dotted line)*:

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- ☒ **AZ** Azerbaijan
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- ☒ **BB** Barbados
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- ☒ **DM** Dominica
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Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

- ☐ .....
- ☐ .....

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)*

Box No. VI PRIORITY CLAIM ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) 9/3/99 9 March 1999	99 00822-9	SE		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s): (1)

* *Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):*
ISA/ SE

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority):*
Date *(day/month/year)*: 9 March, 1999 Number: SE99/00339 Country *(or regional Office)*: SE

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following **number of sheets**:

request	4 ✓
description (excluding sequence listing part)	7 ✓
claims	2 ✓
abstract	1 ✓
drawings	1 ✓
sequence listing part of description	
Total number of sheets	15 ✓

This international application is **accompanied by** the item(s) marked below:

1. ☐ fee calculation sheet
2. ☒ separate signed power of attorney
3. ☒ copy of general power of attorney; reference number, if any: 332
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☒ other *(specify)*: ITS-report

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: Swedish

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Nobel Biocare AB (publ)

/ Gunnar Olsson / AGENT

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1. Date of actual receipt of the purported international application: 2000 -02- 23
2. Drawings: ☒ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA/SE
6. ☐ Transmittal of search copy delayed until search fee is paid.

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Date of receipt of the record copy by the International Bureau: 01 MAY 2000

The Swedish Patent Office
PCT International Application

PCT/SE 00 / 0 0 3 5 1

1 4 -04- 2000

Fig. 1

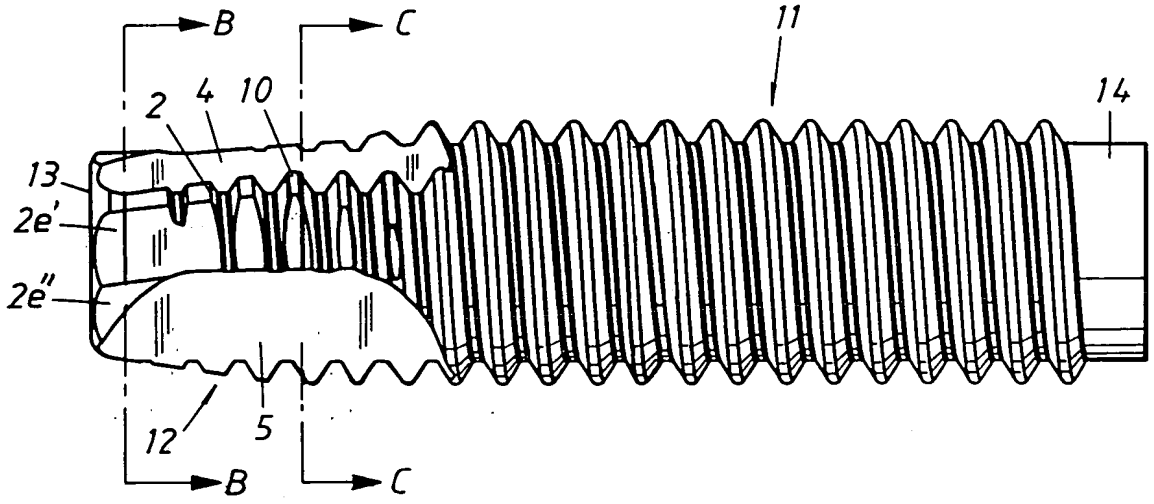
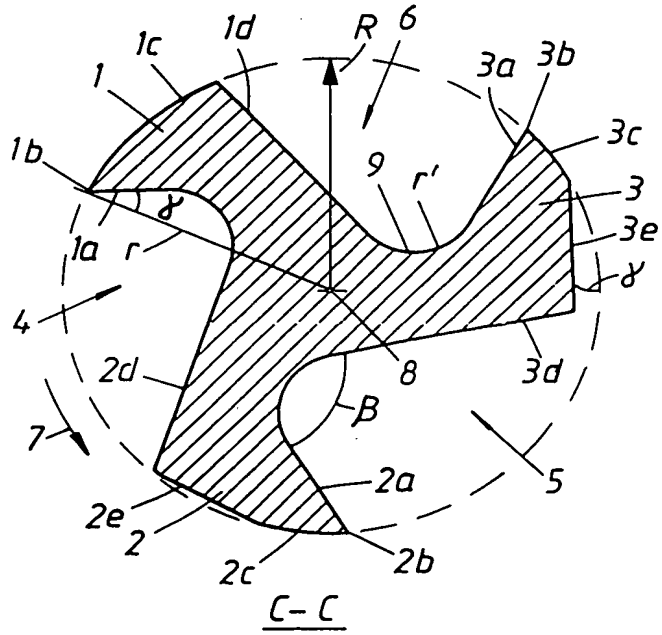
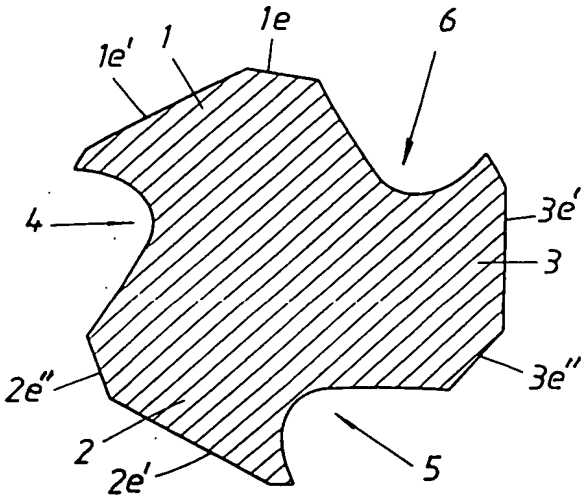


Fig. 2



C – C



B – B

Fig. 3

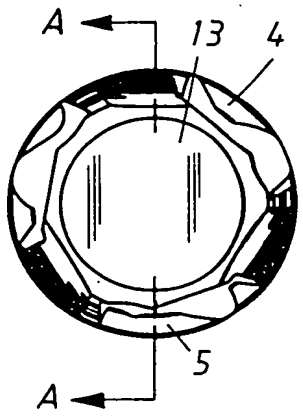
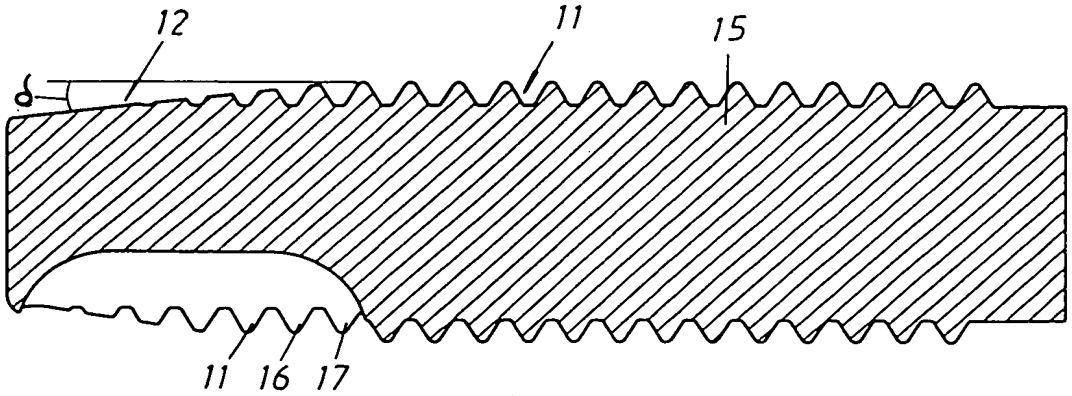


Fig. 4



A–A

(Case 4101)

BENÄMNING

Självgängande implantat.

TEKNISKT OMRÅDE

Föreliggande uppfinning avser ett självgängande implantat för ben, företrädesvis tandben. Implantatet innefattar en stomme och på denna anordnade gängor och ett vid sin framände anordnat koniskt avtagande parti. Dessutom ingår ett eller flera utrymmen, här kallade spånholkar, som vid gängning upplagrar avverkat benmaterial och som är bildade genom godsavtagning i berörda gängor och stommen. Respektive godsavtagen gänga uppvisar en från ytterkanten på respektive kvarvarande del inåt sig sträckande skärkant som vid gängningen samverkar med benet/tandbenet.

TEKNIKENS STÅNDPUNKT

Självgängande dentala implantat är väl förut kända. Karakteristiskt för många implantattyper är att de uppvisar en förhållandevis tät gängbildning. Det förekommer även implantat med förhållandevis gles gängbildning. Det är även känt att förse implantat med multipla gängor, exempelvis dubbelgängor, medelst vilka iskruvningshastigheten kan ökas. I grunden syftar använda gängutformningar till att åstadkomma en underlättad iskruvningsfunktion för implantat i tandben eller andra människokroppsrelaterade ben och en initial förankring av implantatet i benet. Det hänvisas bl.a. till det svenska patentet 9601913-8, vilket visar ett implantat med koniskt avtagande framände och anordnade utrymmen eller spånholkar för avverkat benmaterial. Det hänvisas även till EP 0 641 549 som visar att det är i och för sig förut känt att använda multipla gängor på implantat.

REDOGÖRELSE FÖR UPPFINNINGEN

TEKNISKT PROBLEM

Det föreligger rent allmänt behov av att kunna erhålla goda skäregenskaper på implantatet så att detta kan installeras utan förgängning, vilket bl.a. kräver att implantatet måste anordnas med en gängskärande spets som är utformad med en speciell skärgeometri. Uppfinningen avser att lösa bl.a. detta problem.

I anslutning till implantatets utformning vill man inte behöva ta hänsyn till tät gängbildning som ger låg isättningshastighet. Man önskar inte heller utnyttja sig av gles gängbildning som ger små gängytor mot benvävnaden och därmed sämre förutsättningar för framgångsrik osseointegration. Om gängan ges en djup profil kan man kompensera för detta, men på bekostnad av implantatets hållfasthet. Användandet av dubbelgänga är inte heller helt problemfritt i sammanhanget eftersom en dubbelgänga i varje ögonblick vid insättningen skall skära bort dubbelt så mycket ben, vilket medför att det dubbelgängade implantatet möter ett betydligt större motstånd från benet. Skärmotståndet blir teoretiskt sett ungefär dubbelt så stort. Under insättningen verkar också friktionskrafter som gör att det totala motståndet kan bli ca 50% högre jämfört med fallet där man har motsvarande implantatgeometri vid enkelgänga. Dubbelgängade implantat används därför med fördel främst i mjuka benkvaliteter. Användningen vid hårt ben av dubbelgängade implantat medför å andra sidan att höga insättningsmotstånd erhålles från benet. Ett implantat kan alltid installeras om gängtapp användes, men då innebär inte ett dubbelgängat utförande någon förenkling eller tidsbesparing. Föreliggande uppfinning löser även denna problematik och anvisar ny väg genom att implantatet skall förses med framträdande goda skäregenskaper som medför att det kan installeras utan förgängning i aktuellt ben eller tandben.

Vid hithörande slag av implantat föreligger även krav på att implantatet skall utföras med tillräckliga hållfasthetsegenskaper. Detta är speciellt viktigt vid hårda ben där motståndet mot iskruvningsfunktionen kan vara stort. Kravet på stor eller tillräcklig hållfasthet är ofta motstridigt kravet på en ändamålsenlig skärgeometri eller gängutformning. Uppfinningen löser även detta problem.

LÖSNINGEN

Den nya vägen som anvisas genom uppfinningen innefattar bl.a. att implantatets gängskärande spets skall utformas med speciell skärgeometri som i utföringsformer kombineras med i och för sig kända särdrag, vilket sammantaget ger en speciellt fördelaktig gängningsfunktion för det självgängande implantatet.

Det som huvudsakligen kan anses vara kännetecknande för ett implantat enligt uppfinningen är att respektive skärkant av ett antal, företrädesvis samtliga, av de avtagna gängornas skärkanter uppvisar en spetsform som i berörd gängas tvärsnitt väsentligen följer en sträckning som avviker från en radie genom kvarvarande gängdels främre parti eller spetsformens spets. Den av spetsformen bildade skär- eller spånvinkeln är vald för att ge en effektiv gängbildningsegenskap som är relationsställd till implantatets gängningsegenskap, dvs tillförsäkrar tillräckligt med kvarvarande godsreducerad gänga och stomme. Relationsställningen mellan skäregenskaper och hållfasthet är företrädesvis optimal.

I en föredragen utföringsform är skär- eller spånvinkeln vald till ca 20°, och väljes företrädesvis inom ett intervallområde av 15-40°. Nämnda vidareutvecklingar kan även innefatta att skärkanten på en första kvarvarande gängdel övergår via en radie eller buktad del till en bakkant på en andra kvarvarande gängdel, vilken ligger före den första gängdelen i implantatets iskruvningsriktning. Radien eller den buktade delen är därvid anordnad för att ge optimalt kvarvarande gods i stommen och kvarvarande gängdel eller gängdelar och därmed optimal hållfasthet i aktuell implantatdel.

Implantatets koniskt avtagande parti eller spets skall företrädesvis vara anordnat eller anordnad att uppbära åtminstone två gängdelar som sträcker sig ut till ifrågavarande gängas fullradiemått. Det konformade partiets eller den konformade implantatspetsens spetsvinkel skall företrädesvis understiga ca 20°. En gängsläppning som effektueras av avtagna eller godsreducerade gängdelar anordnas företrädesvis på det koniskt avtagande partiet eller spetsen i syfte att minska eller minimera klämningstendenser mellan implantatet och benvävnaden under gängningen. Den spånskjutande eller spåndragande

skärkanten anordnas vidare företrädesvis icke-axiell. En eller flera kvarvarande gängdelar på en eller flera gängor är försedda med godsreducering bakom, sett i iskruvningsriktningen, fulldiameterdelen som är engagerbar med benet eller benvävnaden i syfte att underlätta släppningsfunktionen vid gängningen.

FÖRDELAR

Med det i ovanstående föreslagna erhålles en framträdande god iskruvningsfunktion för implantat i tandben eller annan bentyp. Utformningen på de specifika skärkanterna respektive kvarvarande gängdel och anslutningen av denna mot stommen garanterar en god hållfasthet hos implantatet samtidigt som tillräckligt stor gängad periferi erhålles för implantatet. Denna geometri på spårholkarna, skärkanter och stommen kan åstadkommas med hjälp av fräsning med s.k. laxfräs som uppvisar avrundade hörn. Spånholkarna kan ges tillräcklig volym, dvs volymen kan utformas så stor eller stora att det avverkade benet ryms utan allt för stor grad av kompression som kan ge upphov till friktion mellan fixtur och omgivande benvävnad vid installation eller iskruvning. Utformningen möjliggör även att klämningstendenser kan minimeras mellan fixturen/implantatet och benvävnaden.

FIGURBESKRIVNING

En för närvarande föreslagen utföringsform av ett implantat enligt uppfinningen skall beskrivas i nedanstående under samtidig hänvisning till bifogade ritningar där

figur 1 visar en sidovy av implantatet,

figur 2 i två tvärsnitt B-B och C-C visar godsreducerad eller godsavtagen gänga med kvarvarande gängdelar och dessas specifika skärkantsarrangemang,

figur 3 i ändvy visar implantatet enligt figuren 1, och

figur 4 visar längdsnittet A-A enligt figuren 3.

DETALJERAD UTFÖRINGSFORM

I figur 1 visas en sidovy av ett implantat som uppvisar en cylindrisk gängad del och ett främre konformat parti med godsreducerade gängor. I figuren 2 visas tvärsnitten B-B och C-C genom de godsreducerade gängorna enligt figuren 1. Enligt figuren 2 och tvärsnittet C-C är en godsreducerad eller godsavtagen gänga visad med sina kvarvarande gängdelar 1, 2 eller 3 som i det här fallet är tre till antalet. Mellan gängdelarna föreligger utrymmen 4, 5, 6 som lagrar avverkad benvävnad. Gängdelarna och utrymmena är i utföringsexemplet väsentligen jämnt fördelade utefter implantatets omkrets. Annan fördelning och annat antal utrymmen kan förekomma. Implantatets omkretsriktning är markerad med 7 och implantatets axel vinkelrätt mot figurplanet är markerad med 8.

Gängdelarna är försedda med skärkanter 1a, 2a respektive 3a som samverkar med eller skär in i benvävnad vid implantatets igängning i benet i omkretsriktningen 7. Karakteristiskt för skärfunktionen är att skärkanterna är utförda med spetsar eller delar 1b, 2b respektive 3b. Gängdelarna uppvisar även längs fullmåttsradien R eller längs omkretsriktningen 7 sig sträckande delar 1c, 2c respektive 3c som bestämmer gängdiametern i benet som åstadkommes med ifrågavarande gänga. Gängdelarnas baksidor är angivna med 1d, 2d respektive 3d.

För bildande av skärkant med skärvinkel (eller spånvinkel) α sträcker sig skärkanten i förhållande till aktuell radie r med nämnda vinkel α som kan väljas ca 20° eller inom området 15-40°. Vid sina inre delar övergår skärkanten på en första gängdel, t.ex. gängdelen 3, till baksidan, t.ex. baksidan 1d, på en angränsande gängdel, t.ex. gängdelen 1, via en radieformade eller svängd övergångsdel 9 som uppvisar en viss längdutsträckning vinkelrätt mot figurplanet. En radie för den svängda delen är angiven med r'. En eller flera av de kvarvarande gängdelarna kan uppvisa en släppkant 2e, 3e, bakom sin cirkelformade del, 2c respektive 3c.

I figuren 2 är angivet en vinkel β mellan skär- och bakkanter på varandra efterföljande gängdelar, sett i rotationsriktningen 7. Vinkeln β skall i utföringsexemplet vara ca 70°, och kan vara av samma storlek eller olika storlekar. En släppningsvinkel γ mellan den cirkulära delen 3c och släppytan 3e är vald 5-10°.

I figuren 1 är den i tvärsnitt i figuren 1 visade reducerade gängan angiven med 10. Även utrymmenas 4 och 5 lägen framgår, varvid den kvarvarande gängdelen mellan dessa båda utrymmen har markerats med 2. Implantatet eller fixturen uppvisar en cylindrisk del 11 med icke godsreducerade gängor och ett främre konformat parti 12 med godsreducerade gängor. Urtagningarna eller holkarna har utbildats genom godsreducering i nämnda gängor och i implantatets stomme. Implantatets fria ände, som är väsentligen rak och vald vinkelrätt i förhållande till implantatets längdaxel, är visad med 13. Implantatets övre del är visad med 14. Som framgår av figuren består släppkanten 2e hos den kvarvarande gängdelen 2 av två i huvudsak plana släppytor 2e´och 2e´´ som bildar en trubbig vinkel med varandra. Detta framgår bäst av tvärsnittet B-B i figuren 2, där respektive släppytor har indikerats.

I ändvyn i figuren 3 visas ytan 13 och nedre kanten hos utrymmena 4 och 5. Ett längdsnitt A-A genom implantatets längdaxel visas i figuren 4 nedan.

I figuren 4 är implantatets stomme angiven med 15. Det konformade partiet (eller spetsen) 12 är utförd med en spetsvinkel δ som i det här fallet uppgår till c:a 10° . Benholkarna eller utrymmena 4, 5 och 6 (se även figuren 1) är belägna i det konformade partiet 12 och fortsätter delvis upp i det cylindriska partiet . Genom ovanstående erhålles icke-axiellt anordnade skärkanter genom de på varandra överliggande reducerade gängorna. En godsreducerad gänga skall uppvisa åtminstone en, företrädesvis åtminstone två, gängdelar med skär som når ut till berörd gängas omkrets. På det konformade partiet 12 uppvisar skärkanten i det här fallet tre gängdelar 11, 16, 17 som går ut till den fulla radien, t.ex. r i figuren 1. För andra längder kan antalet gängdelar minskas eller ökas, men behöver vara minst en.

Implantatet kan förses med en, två eller flera gängingångar eller spiraler. Spiralerna kan sträcka sig i implantatets höjdled helt eller delvis, dvs en del, t.ex. 14, kan vara försedd med dubbel- eller multipelgängarrangemang, och en del, t.ex. 13, kan vara försedd med enkel- eller på gängantalet sig skiljande gängarrangemang, eller vice versa

Uppfinningen är inte begränsad till den i ovan såsom exempel visade utföringsformen utan kan underkastas modifikationer inom ramen för efterföljande patentkrav och uppfinningstanken.

PATENTKRAV

1. Självgängande implantat (11, 12) för ben, företrädesvis tandben, och innefattande en stomme (15) och på denna anordnade gängor (11, 16-17), ett vid sin framände anordnat koniskt avtagande parti (12), och ett eller flera vid gängning avverkat benmaterial lagrande utrymmen eller spånholkar (4, 5, 6) som är bildade genom godsavtagning i berörda gängor och stommen, varvid respektive godsavtagen gänga (t.ex. 11) uppvisar en från ytterkanten på respektive kvarvarande gängdel inåt sig sträckande skärkant (1a, 2a, 3a) som vid gängningen samverkar med benet, k ä n n e t e c k n a t därav, att respektive skärkant av ett antal, företrädesvis samtliga, av de avtagna gängornas skärkanter uppvisar en spetsform (1b, 2b, 3b) som i berörd gängas tvärsnitt väsentligen följer en sträckning som avviker från en radie (r) genom kvarvarande gängdels främre parti eller spetsformens spets (1b, 2b, 3b) och att skärkanten (1a, 2a, 3a) på en första kvarvarande gängdel (1, 2, 3) övergår via en radie (r´) eller buktad del till en bakkant (t.ex. 2d) på en andra kvarvarande gängdel vilken är anordnad före den första gängdelen i iskruvningsriktningen (7), för att ge en till implantatets hållfasthet relaterad effektiv gängningsegenskap.

2. Implantat enligt patentkravet 1, k ä n n e t e c k n a t därav, att en av spetsformen (1b, 2b, 3b) bildad skär- eller spånvinkel (α) är vald till ca 20°.

3. Implantat enligt patentkravet 1, k ä n n e t e c k n a t därav, att skär- eller spånvinkeln är vald inom ett intervallområde av 15-40°.

4. Implantat enligt patentkravet 3, k ä n n e t e c k n a t därav, att radien (r') eller den buktade delen (10) är anordnad för att ge optimalt kvarvarande gods i stommen och kvarvarande gängdelar och därmed optimal hållfasthet i aktuell implantatdel.

5. Implantat enligt något av föregående patentkravet, k ä n n e t e c k n a t därav, att på det koniskt avtagande partiet (12) är anordnat med godsreducerade gängdelar med fullmåttsradie och som är åtminstone två till antalet.

6. Implantat enligt något av föregående patentkravet, k ä n n e t e c k n a t därav, att det konformade partiets (12) spetsvinkel understiger 20°.

7. Implantat enligt något av föregående patentkravet, k ä n n e t e c k n a t därav, att respektive av godsreducerad gängdel effektuerad gängsläppning eller släppkant (2e, 3e) är anordnad huvudsakligen i det koniskt avtagande partiet och bakom, sett i iskruvningsriktningen, respektive fullradiedel (2c, 3c) som är engagerbar med benet, i syfte att underlätta släppningsfunktion vid gängningen.

8. Implantat enligt patentkravet 7, k ä n n e t e c k n a t därav, att resektive släppkant (2e, 3e) består av två i huvudsak plana släppytor (2e´, 2e´´) vilka bildar en trubbig vinkel med varandra.

9. Implantat enligt något av föregående patentkrav, k ä n n e t e c k n a t därav, att det uppvisar utefter hela eller delar av sin sträckning dubbel- eller multipelgänga.

10. Implantat enligt patentkravet 9, k ä n n e t e c k n a t därav, att ett första parti är försett med dubbel- eller multipelgänga, och ett andra parti är försett med enkelgänga eller gängantalsbildning som skiljer sig från gängantalsbildningen på det första partiet, eller vice versa.

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23-02-2000

SAMMANDRAG

Ett självgängande implantat för tandben innefattar en stomme (15) och på denna anordnade gängor, ett vid sin framände. anordnat koniskt avtagande parti (12) och ett eller flera vid gängning påverkade benmaterial lagrande utrymmen (4, 5, 6) som är bildade genom godsavtagning i berörda gängor och stommen. Respektive godsreducerad gänga uppvisar en från ytterkanten på respektive kvarvarande gängdel inåt sig sträckande skärkant (1a, 2a, 3a) som vid gängningen är samverkbar med benet. Respektive skärkant av ett antal skärkanter uppvisar en spetsform (1b, 2b, 3b) som i berörd gängas tvärsnitt väsentligen följer en sträckning som avviker från en radie (r) genom kvarvarande gängdels främre parti eller spetsformens spets (1b, 2b, 3b) för att på så sätt bilda en skärvinkel. Respektive skärkant (1a, 2a, 3a) på en första kvarvarande gängdel (1, 2, 3) övergår via en radie (r´) eller buktad del till en bakkant (t.ex. 2d) på en andra kvarvarande gängdel, vilken är anordnad före den första gängdelen i iskruvningsriktningen (7), i avsikt att ge optimalt kvarvarande gods i stommen och kvarvarande gängdelar och därmed optimal hållfasthet i aktuell implantatdel.

Det föreslås att figuren 1 får medfölja sammandraget.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 4101 PCT	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SE00/00351	International filing date *(day/month/year)* 23.02.2000	Priority date *(day/month/year)* 09.03.1999
International Patent Classification (IPC) or national classification and IPC7 A 61 C 8/00		
Applicant Nobel Biocare AB (publ) et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
12.09.2000	02.08.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88 Telex 17978 PATOREG-S	Authorized officer Jack Hedlund/Els Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00351

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed

☒ the description:
pages 1-8 , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

☒ the claims:
pages _____ , as originally filed
pages _____ , as amended (together with any statement) under article 19
pages _____ , filed with the demand
pages 1-4 , filed with the letter of 05.04.2001

☒ the drawings:
pages 1-2 , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

☐ the sequence listing part of the description:
pages _____ , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language english which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☒ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00351

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-7	YES
	Claims		NO
Inventive step (IS)	Claims	1-7	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-7	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The claimed invention relates to a self-tapping implant.

The object of the invention is to provide good cutting characteristics on the implant.

This is achieved by an implant comprising a body with threads and a conically tapering portion arranged at its front end and one or more spaces, which are formed by removal of material from the threads and body in question.

New, amended claims have been filed 05.04.2000. New claim 1 corresponds to previous claims 1, 3, 7 and 9. New claim 2 corresponds to previous claim 2. New claim 3 corresponds to previous claim 5. New claim 4 corresponds to previous claim 6. New claim 5 corresponds to previous claim 8. New claim 6 corresponds to previous claim 10. New claim 7 corresponds to previous claims 1 and 4 and figure 2.

The following documents are cited in the search report:

(D1) WO 9703621 A1
(D2) WO 9743976 A1
(D3) EP 0641549 A2

.../...

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

(D1) relates to a self-tapping dental implant comprising a generally cylindrical body having a threaded outer surface tapering inwardly. The body has a plurality of longitudinal recesses formed in the threaded surface and extending through a plurality of thread turns forming a sequence of self-tapping cutting edges. The plane of the cutting surfaces may be tilted to form an acute angle in transverse cross-section forming a chisel-like corner at the outermost edge of the cutting surface. See especially fig 14 and 15 and page 10, line 21 - page 11, line 7.

(D2) relates to an implant having a relief surface.

(D3) relates to an implant having multiple threads.

The claimed invention in the new claims 1 - 7 is not considered to be anticipated by these documents. None of the documents or any relevant combination of them reveal a self-tapping implant as described by these claims.

Consequently, the cited documents only disclose the general state of the art, which is not considered to be of particular relevance. Therefore, the claimed invention differs from what is disclosed in the cited documents and is considered to fulfil the requirements of novelty, inventive step and industrial applicability.

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(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

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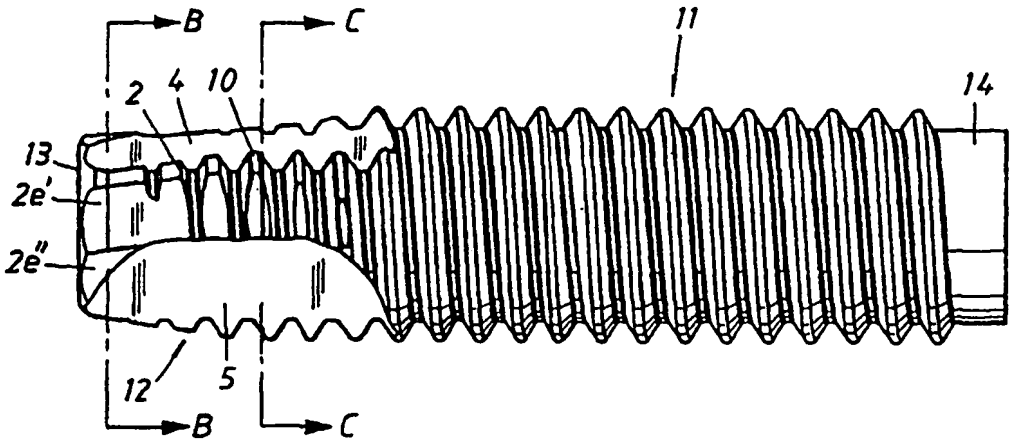
(54) Title: SELF–TAPPING IMPLANT



(57) Abstract

A self–tapping implant for jawbone comprises a body (15) with threads arranged thereon, a conically tapering portion (12) arranged at its front end, and one or more spaces (4, 5, 6) which accommodate bone material cut off during tapping and which are formed by removal of material from the threads and body in question. Each materially reduced thread has a cutting edge (1a, 2a, 3a) which extends inwards from the outer edge of the repective remaining thread part and which can cooperate with the bone during tapping. Each cutting edge of a number of cutting edges has a pointed shape (1b, 2b, 3b) which, in the cross section of the thread in question, essentially follows a line which deviates from a radius (r) through the remaining thread part's front portion or the pointed shape's point (1b, 2b, 3b) in order in this way to form a cutting angle. Each cutting edge (1a, 2a, 3a) on a first remaining thread part (1, 2, 3) merges via a radius (r') or curved part into a rear edge (e.g. 2d) on a second remaining thread part, which is arranged before the first thread part in the direction of screwing (7), for the purpose of providing optimum remaining material in the body and remaining thread parts and, consequently, optimum strength of the implant part in question.

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TITLE

Self-tapping implant

TECHNICAL FIELD

The present invention relates to a self-tapping implant for bone, preferably jawbone. The implant comprises a body with threads arranged thereon, and a conically tapering portion arranged at its front end. In addition, there are one or more spaces, here called bone-chip recesses, which accommodate bone material cut off during tapping and which are formed by removal of material from the threads and body in question. Each materially reduced thread has a cutting edge which extends inwards from the outer edge of the respective remaining part and which cooperates with the bone/jawbone during tapping.

PRIOR ART

Self-tapping dental implants are already well known. A characteristic of many implant types is that they have a relatively dense threading. There are also implants with relatively sparse threading. It is also known to provide implants with multiple threads, for example double threads, by which means the speed of screwing can be increased. In principle, the thread configurations used aim to make it easier to screw the implants into jawbone or other bone in the human body, and to provide initial anchoring of the implant in the bone. Reference is made, inter alia, to Swedish Patent 9601913-8, which discloses an implant with a conically tapering front end and with spaces or bone-chip recesses provided for bone material that has been cut off. Reference is also made to EP 0 641 549 which shows

that it is already known per se to use multiple threads on implants.

DESCRIPTION OF THE INVENTION

TECHNICAL PROBLEM

There is a general need to provide good cutting characteristics on the implant so that the latter can be fitted without preliminary threading, which means, among other things, that the implant has to be designed with a thread-cutting point which is formed with a special cutting geometry. The invention aims to solve this problem among others.

In connection with the design of the implant, the aim is to avoid using a dense threading, as this entails a low insertion speed. Nor is a sparse threading wanted, as this entails small thread surfaces in contact with the bone tissue and, consequently, poor conditions for successful osseointegration. If the thread is given a deep profile, it is possible to compensate for this, but at the expense of the implant's strength. The use of double threads is not completely free of problems either in this context, since a double thread, at each moment of insertion, must cut away twice as much bone, which means that the double-threaded implant meets considerably greater resistance from the bone. Theoretically, the cutting resistance is approximately twice as great. During insertion, frictional forces also have the effect that the total resistance can be about 50% higher compared to the case of a corresponding implant geometry with a single thread. For this reason, double-threaded implants are advantageously used mainly in soft bone. The use of double-threaded implants in hard bone entails high insertion resistance from the bone. An implant can always be fitted using a thread tap, but a double-threaded design does not then represent any simplification or saving in time. The present invention also solves this problem and discloses a novel approach

in which the implant is provided with excellent cutting characteristics which mean that it can be fitted without preliminary threading in the bone or jawbone in question.

In these types of implants, there is a further requirement that the implant must be designed with sufficient strength. This is especially important in hard bone, where the resistance to the screwing-in function can be considerable. The need for considerable or sufficient strength is often in conflict with the need for a suitable cutting geometry or thread design. The invention solves this problem too.

SOLUTION

The novel approach disclosed by the invention entails, inter alia, that the thread-cutting point of the implant is designed with a special cutting geometry which in embodiments is combined with features known per se, and these, taken together, afford an especially advantageous threading function for the self-tapping implant.

The feature which can principally be regarded as characterizing an implant according to the invention is that each cutting edge of a number, preferably all, of the cutting edges of the removed threads have a pointed shape which, in the cross section of the thread in question, essentially follows a line which deviates from a radius through the remaining thread part's front portion or the pointed shape's point. The cutting angle or chip angle formed by the pointed shape is chosen so as to give an effective threading property which is in relation to the threading property of the implant, i.e. ensures sufficient remaining materially-reduced thread and body. The relationship between cutting properties and strength is preferably optimal.

In a preferred embodiment, the cutting angle or chip angle is about 20° and is chosen preferably within a range of 15-40°. The said refinements can also

include the cutting edge on a first remaining thread part merging via a radius or curved part into a rear edge on a second remaining thread part, which lies before the first thread part in the direction of screwing of the implant. The radius or the curved part is in this case arranged to provide optimum remaining material in the body and remaining thread part or thread parts and, consequently, optimum strength of the implant in question.

The conically tapering portion or tip of the implant must be arranged to support at least two thread parts which extend out to the full radial dimension of the thread in question. The point angle of the cone-shaped portion or cone-shaped implant tip is preferably less than about 20°. A thread relief which is to be effected by removed or materially reduced thread parts is preferably arranged on the conically tapering portion or the point in order to reduce or minimize clamping tendencies between the implant and the bone tissue during threading. The bone chip cutting edge is also preferably arranged non-axially. One or more remaining thread parts on one or more threads are provided with material reduction behind, as viewed in the direction of screwing, the full diameter part which can be engaged with the bone or the bone tissue, for the purpose of facilitating the relief function upon threading.

ADVANTAGES

By means of what has been proposed above, an excellent screwing function is obtained for implants in dentine or other bone types. The design of the specific cutting edges and the remaining thread part and the connection of this to the body guarantee good strength of the implant, and at the same time a sufficiently large threaded periphery is obtained for the implant. This geometry of the bone-chip recesses, cutting edges and body can be obtained by milling with a so-called

dovetail cutter which has rounded corners. The bone-chip recesses can be given adequate volume, i.e. the volume can be made so great that the detached bone is accommodated without excessive compression, which can give rise to friction between fixture and surrounding bone tissue upon insertion or screwing. The design also means that clamping tendencies between the fixture/implant and the bone tissue can be minimized.

DESCRIPTION OF THE FIGURES

A presently proposed embodiment of an implant according to the invention will be described below with reference to the attached drawings, in which:

Figure 1 shows a side view of the implant,

Figure 2 shows, in two cross sections B-B and C-C, a thread with reduced material or with material removed, and its remaining thread parts and specific cutting edge arrangement,

Figure 3 shows an end view of the implant according to Figure 1, and

Figure 4 shows the longitudinal section A-A according to Figure 3.

DETAILED EMBODIMENT

Figure 1 shows a side view of an implant which has a cylindrical threaded part and a front, cone-shaped portion with materially reduced threads. Figure 2 shows the cross sections B-B and C-C through the materially reduced threads according to Figure 1. According to Figure 2 and the cross section C-C, a thread with material reduction or material removed is shown with its remaining thread parts 1, 2 or 3 which in this case are three in number. Between the thread parts there are spaces 4, 5, 6 which accommodate detached bone tissue. In this illustrative embodiment, the thread parts and the spaces are essentially uniformly distributed about the circumference of the

implant. Another pattern of distribution and another number of spaces are possible. The circumferential direction of the implant is indicated by 7 and the implant axis at right angles to the plane of the figure is indicated by 8.

The thread parts are provided with cutting edges 1a, 2a and 3a which cooperate with or cut into bone tissue when the implant is being threaded into the bone in the circumferential direction 7. A characteristic feature of the cutting function is that the cutting edges are designed with points or parts 1b, 2b, 3b. The thread parts also have parts 1c, 2c and 3c which extend along the full radius R or along the circumferential direction 7 and which define the thread diameter in the bone produced with the thread in question. The rear sides of the thread parts are indicated by 1d, 2d and 3d.

To form a cutting edge with cutting angle (or chip angle) α, the cutting edge extends in relation to the actual radius r at the said angle α which can be chosen at about 20° or within the range of 15-40°. At its inner parts, the cutting edge on a first thread part, for example thread part 3, merges into the rear side, for example the rear side 1d, of an adjoining thread part, for example thread part 1, via a radius-shaped or curved transition part 9 which has a certain length at right angles to the plane of the figure. A radius for the curved part is indicated by r'. One or more of the remaining thread parts can have a relief edge 2e, 3e, behind its circular part 2c and 3c, respectively.

Figure 2 shows an angle β between cutting and rear edges of successive thread parts, as viewed in the direction of rotation 7. In this illustrative embodiment, the angle β must be about 70°, and it can be of the same size or different sizes. A relief angle γ between the circular part 3c and the relief surface 3e is chosen at 5-10°.

In Figure 1, the reduced thread shown in cross section in Figure 1 is indicated by 10. The positions of the spaces 4 and 5 can also be seen, the remaining thread part between these two spaces being indicated by 2. The implant or the fixture has a cylindrical part 11 with non-reduced threads and a front cone-shaped portion 12 with materially reduced threads. The impressions or recesses have been formed by material reduction in the said threads and in the body of the implant. The free end of the implant, which is essentially straight and chosen at right angles in relation to the longitudinal axis of the implant, is indicated by 13. The upper part of the implant is indicated by 14. As can be seen from the figure, the relief edge 2e of the remaining thread part 2 consists of two essentially plane relief surfaces 2e' and 2e'' which form an obtuse angle with each other. This is best seen from the cross section B-B in Figure 2, where respective relief surfaces have been indicated.

In the end view in Figure 3, the surface 13 and the lower edge of the spaces 4 and 5 are shown. A longitudinal section A-A through the longitudinal axis of the implant is shown in Figure 4 below.

In Figure 4, the body of the implant is indicated by 15. The cone-shaped portion (or point) 12 is designed with a point angle δ which in this case is up to about 10°. The bone-chip recesses or spaces 4, 5 and 6 (see also Figure 1) are located in the cone-shaped portion 12 and continue partially into the cylindrical portion. By means of the above, non-axially arranged cutting edges are obtained via the reduced threads overlying one another. A materially reduced thread must have at least one thread part, preferably at least two thread parts, with cutting edges which reach the circumference of the thread in question. On the cone-shape portion 12, the cutting edge in this case has three thread parts 11, 16, 17 which extend to the full radius, for example r in Figure 1. For other

lengths, the number of thread parts can be reduced or increased, but it needs to be at least one.

The implant can be provided with one, two or more thread leads or spirals. The spirals can extend wholly or partly in the vertical direction of the implant, i.e. one part, for example 14, can be provided with a double-thread or multiple-thread arrangement, and a part, for example 13, can be provided with a single-thread arrangement or a thread arrangement with different thread number, or vice versa.

The invention is not limited to the embodiment shown above by way of example, but can be modified within the scope of the attached patent claims and the inventive concept.

PATENT CLAIMS

1. Self-tapping implant (11, 12) for bone, preferably jawbone and comprising a body (15) with threads (11, 16-17) arranged thereon, a conically tapering portion (12) arranged at its front end, and one or more spaces or bone-chip recesses (4, 5, 6) which accommodate bone material cut off during tapping and which are formed by removal of material from the threads and body in question, each materially reduced thread (e.g. 11) having a cutting edge (1a, 2a, 3a) which extends inwards from the outer edge of the respective remaining thread part and which cooperates with the bone during tapping, characterized in that each cutting edge of a number, preferably all, of the cutting edges of the removed threads have a pointed shape (1b, 2b, 3b) which, in the cross section of the thread in question, essentially follows a line which deviates from a radius (r) through the remaining thread part's front portion or the pointed shape's point (1b, 2b, 3b), and in that the cutting edge (1a, 2a, 3a) on a first remaining thread part (1, 2, 3) merges via a radius (r') or curved part into a rear edge (e.g. 2d) on a second remaining thread part, which is arranged before the first thread part in the direction of screwing (7), for the purpose of providing an effective threading characteristic related to the strength of the implant.

2. Implant according to Patent Claim 1, characterized in that a cutting angle or chip angle (α) of about 20° is chosen, formed by the pointed shape (1b, 2b, 3b).

3. Implant according to Patent Claim 1, characterized in that the cutting angle or chip angle is chosen within a range of 15-40°.

4. Implant according to Patent Claim 3, characterized in that the radius (r') or the curved part (10) is arranged to provide optimum remaining

material in the body and remaining thread parts and, consequently, optimum strength of the implant part in question.

5. Implant according to any of the preceding patent claims, characterized in that the conically tapering portion (12) is arranged with materially reduced thread parts with full radius and which are at least two in number.

6. Implant according to any of the preceding patent claims, characterized in that the point angle of the cone-shaped portion (12) is less than 20°.

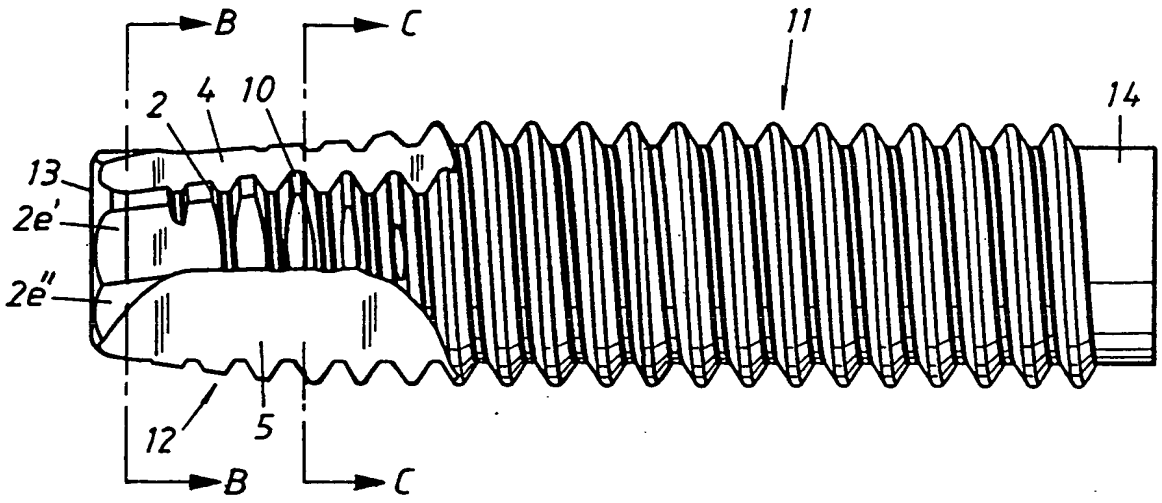
7. Implant according to any of the preceding patent claims, characterized in that each thread relief or relief edge (2e, 3e) effected by the materially reduced thread part is arranged essentially in the conically tapering portion and behind, as viewed in the direction of screwing, each full radius part (2c, 3c) which can be engaged with the bone, for the purpose of facilitating the relief function on threading.

8. Implant according to Patent Claim 7, characterized in that each relief edge (2, 3e) consists of two essentially plane relief surfaces (2e', 2e'') which form an obtuse angle with each other.

9. Implant according to any of the preceding patent claims, characterized in that it has double or multiple threads along all or part of its length.

10. Implant according to Patent Claim 9, characterized in that a first portion is provided with a double or multiple thread, and a second portion is provided with a single thread or thread numbering different from the thread numbering of the first portion, or vice versa.

Fig. 1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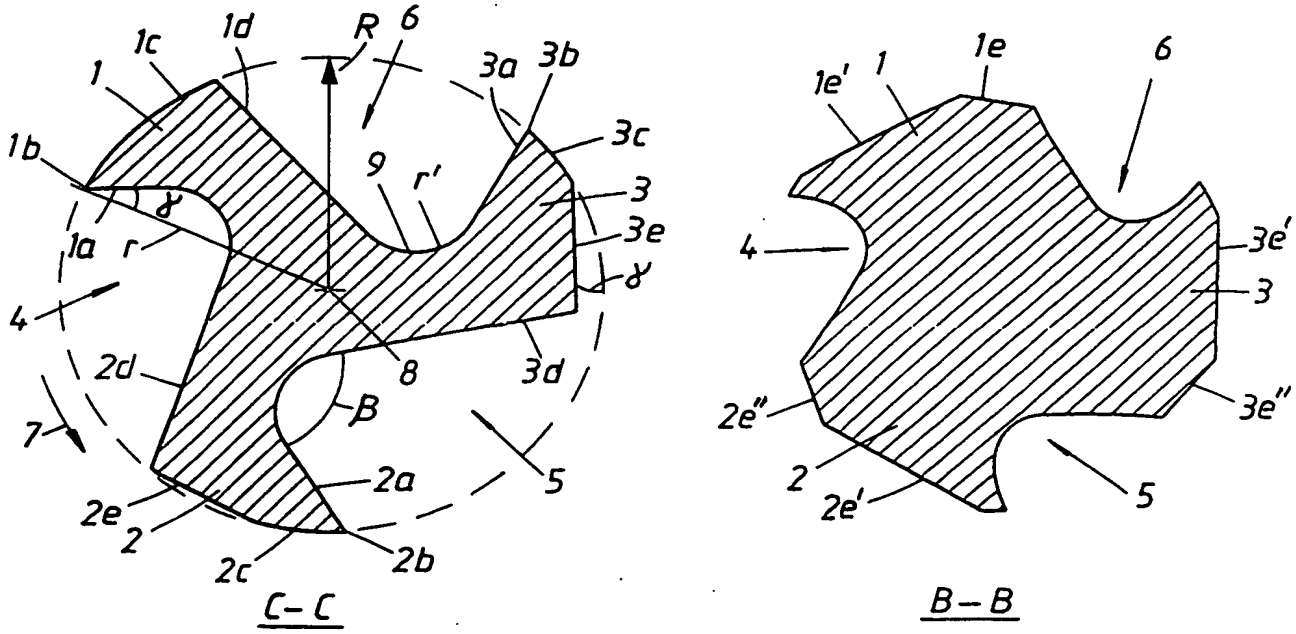
2
4
10
13
2e'
2e''
12
5
B
C

Fig. 2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1d
R
6
3a
3b
1b
3c
9
r'
3
3e
1a
r
γ
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2d
8
3d
B
7
2a
5
2e
2
2c
2b
C – C
1e'
1
1e
6
4
3e'
3
2e''
3e''
2
2e'
5
B – B

Fig. 3

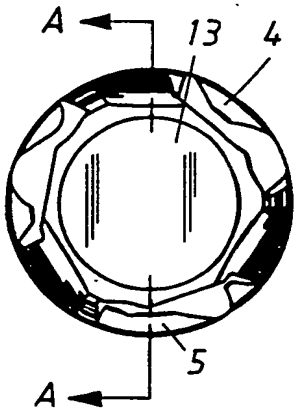
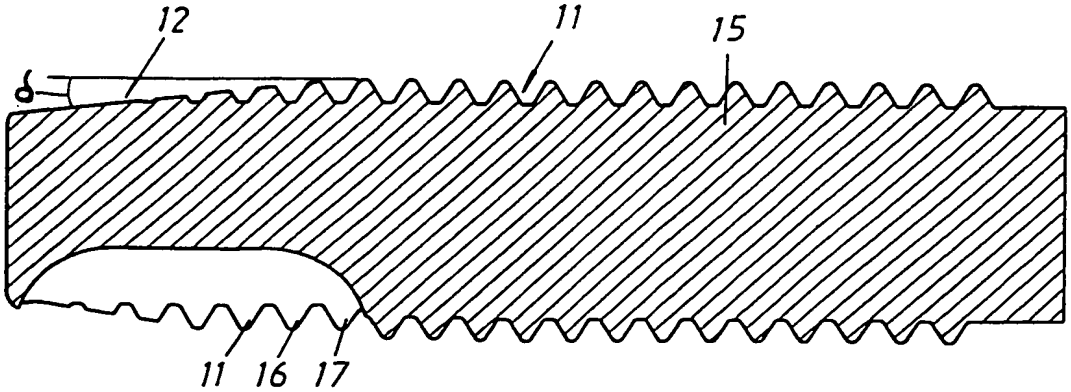


Fig. 4



A–A

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00351

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61C 8/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9703621 A1 (IMPANT INNOVATIONS, INC.), 6 February 1997 (06.02.97), page 10, line 21 - page 11, line 7, figures 14,15	1-10
A	WO 9743976 A1 (NOBEL BIOCARE AB), 27 November 1997 (27.11.97)	1-10
A	EP 0641549 A2 (ZEST ANCHORS, INC.), 8 March 1995 (08.03.95)	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 July 2000	24-07-2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jack Hedlund/gh Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/SE 00/00351

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